ETLA Working Papers | 73 9.12.2019

The Costs of Job Loss and Task Usage

Antti Kauhanen
The Research Institute of the Finnish Economy and Jyväskylä University School of Business and Economics
antti.kauhanen@etla.fi

Krista Riukula
The Research Institute of the Finnish Economy
krista.riukula@etla.fi

Suggested citation:
Kauhanen, Antti & Riukula, Krista (9.12.2019). "The Costs of Job Loss and Task Usage".

ETLA Working Papers No 73.
http://pub.etla.fi/ETLA-Working-Papers-73.pdf

Abstract

This study examines the degree to which the effects of job loss depend on task usage and task distance to other jobs. We use linked employer-employee data and representative survey data on task usage and plant closures to identify individuals who have lost their jobs involuntarily. We find that the heterogeneity in the cost of job loss is linked to task usage. Workers in origin jobs with high levels of social tasks have smaller employment and earnings losses, whereas workers in routine jobs face larger wage losses. Instead, the distance in task usage between the origin job and other jobs does not matter when the usage of manual, abstract, routine and social tasks is taken into account.

Tiivistelmä

Työpaikan menetyksestä aiheutuvat kustannukset ja työn tehtäväsisällöt

Tässä tutkimuksessa tarkastellaan, missä määrin työpaikan menetyksestä aiheutuvat työllisyys- ja palkkavaikutukset riippuvat työn tehtäväsisällöistä. Käytämme yhdistettyä työnantaja-työntekijäaineistoa sekä edustavaa kyselyaineistoa työn tehtäväsisällöistä. Työpaikan menettäneillä tarkoitamme heitä, jotka menettävät työpaikkansa toimipaikan sulkemisen takia. Tulokset osoittavat, että työpaikan menetyksestä aiheutuvat kustannukset vaihtelevat yksilöiden välillä ja että erot alkuperäisen työn tehtäväsisällöissä selittävät näitä eroja. Työpaikan menetyksestä aiheutuvat työllisyys- ja palkkatappiot ovat pieniä heillä, joiden työn tehtäväsisällöissä korostuvat sosiaaliset tehtävät. Rutiininomaisissa tehtävissä työskennelleet puolestaan kohtaavat merkittävän palkkatappion työpaikan menetyksen seurauksena. Työpaikan menetyksestä aiheutuvat kustannukset riippuvat siitä, missä määrin alkuperäisessä työssä on manuaalisia, abstrakteja, rutiininomaisia ja sosiaalisia tehtäviä, eikä alkuperäisen työn etäisyydestä muihin töihin tehtäväsisällön suhteen.

DSc (Economics) **Antti Kauhanen** is Research Director at ETLA and Professor of Economics at Jyväskylä University School of Business and Economics.

DSc (Economics) **Krista Riukula** is Researcher at ETLA.

KTT **Antti Kauhanen** on Elinkeinoelämän tutkimuslaitoksen tutkimusjohtaja ja taloustieteen professori Jyväskylän yliopiston kauppakorkeakoulussa.

KTT **Krista Riukula** on Elinkeinoelämän tutkimuslaitoksen tutkija.

Acknowledgement: We thank the Strategic Research Council at the Academy of Finland (Grant nos. 303536 & 303533) for funding. We thank the seminar participants at the Helsinki GSE, JSBE, and EALE 2019 and ESPE 2019 conferences.

Kiitokset: Raportti on osa Suomen Akatemian strategisen tutkimuksen neuvoston rahoittamaa hanketta ”Ammattirakenteen muutos haastaa osaamisen” (Polkuja työhön, n:ot 303536, 303533). Kiitämme kommenteista osallistujia seuraavissa seminaareissa ja konferensseissa: Helsinki GSE, EALE 2019, ESPE 2019, JSBE.

Keywords: Job loss, Wage loss, Linked Employer-Employee Data, Specific Human Capital

Asiasanat: Toimipaikan sulkeminen, Palkanmenetys, Yhdistetty työntekijä-työnantaja-aineisto, Spesifi inhimillinen pääoma

JEL: J62, J65, J31, J24

1 Introduction

Several studies find persistent earnings losses for displaced workers [1]. Even if displaced workers' employment levels converge back to the same level as their non-displaced counterparts, the divergence in earnings persists. The theoretical reasons for the earnings losses are still being debated, although specific human capital theory and matching theory seem to be the most promising approaches (Carrington and Fallick, 2017). According to specific human capital theory, earnings losses occur because workers cannot fully utilize their specific human capital in their new jobs. Thin labor markets make even general skills resemble specific human capital because it is difficult in such markets for workers to find employers that value their skill mix as much as their previous employers (Lazear, 2009). Matching theory predicts that the cost of job loss is heterogeneous. On average displaced workers experience earnings losses because they end up in worse matches; however, some individuals may manage to find better matches and thus benefit from displacement.

Ongoing technological change interacts with both theories. It has been well documented that technological change affects the task structures of the economy (e.g., Acemoglu and Autor, 2011; Goos et al., 2014). There is less demand for routine tasks and more demand for abstract or non-routine cognitive tasks. The demand for social tasks has also increased (Deming, 2017). Occupational wage premia have also been affected: the wage premium for routine occupations has decreased, while the wage premium for abstract occupations has increased (Cortes, 2016).[2]

The cost of job loss is likely to be dependent on the task composition of the origin job. Workers who lose routine-intensive jobs may experience exceptionally large losses from displacement. However, some workers may find jobs that utilize tasks that are demanded in the labor market, such as social tasks. Workers are more likely to find such jobs if the

[1] See, e.g., Jacobson et al. (1993); Stevens (1997); Eliason and Storrie (2006); Couch and Placzek (2010); Hijzen et al. (2010); Huttunen et al. (2011); Huttunen and Riukula (2018)

[2] Vainiomäki (2018) shows similar results for Finland for the years 1995 to 2013. The wage ratio for routine occupations compared to abstract occupations has decreased. However, the routine/service wage ratio has increased.

origin job has a task composition close to other jobs in the task space. Understanding the factors determining the earnings loss is important because the losses have adverse consequences for the worker and more workers face the threat of job loss due to occupational restructuring. Moreover, studying the degree to which the cost of job loss depends on task usage may help to distinguish among alternative theories (Carrington and Fallick, 2017).

In this paper, we study how initial task usage affects the size of the shock displaced workers face. Key to our analysis is the Finnish administrative linked employer-employee data and representative survey data on task usage for occupation-industry cells. We use plant closures to identify those who have lost their jobs involuntarily due to exogenous shocks and we follow them for three years before and ten years after the job displacement. Our main question is whether the cost of job loss varies by task usage and the task distance between the origin job and other jobs. The task measures we use are similar to those used in the job polarization literature.

To preview our main results, we find that workers who lose jobs due to plant closures suffer from persistent earnings losses, which is in line with the previous studies. However, we find that the cost of job loss depends on initial task usage. Displaced workers in origin jobs with high levels of social tasks have a higher probability of being re-employed, while employees in jobs with manual tasks have lower re-employment rates. The results also show that workers in routine-intensive jobs suffer from large and persistent earnings losses, if employed, while workers in socially intensive jobs do not suffer from earnings losses, if employed. Moreover, we show that the distance in the task usage between the origin job and other jobs does not matter when task usage (i.e., usage of manual, social, routine and social tasks) is taken into account. However, distance between origin and destination job is associated with lower earnings, if employed. The results concerning the routine-intensive workers are consistent with Blien et al. (2017).

Our paper is related to papers studying the cost of job loss and the heterogeneity behind it. A large literature has shown that the cost of job loss depends on the similarity of pre- and post-displacement jobs in terms of occupation, industry, and region (e.g.,

Addison and Portugal, 1989; Jacobson et al., 1993; Couch and Placzek, 2010). Recent literature has paid attention to the task content of jobs as an explanation for the wage losses following displacement. Kambourov and Manovskii (2009) are among the first to show that the cost of job loss results from the loss of occupation-specific human capital.

More recently Blien et al. (2017) have studied whether the cost of job loss is larger for employees in more routine-intensive occupations than in less routine-intensive occupations. This paper is closest to our study. They find that employees in more routine-intensive occupations face larger and more persistent earnings losses than in less routine-intensive occupations. We extend their investigation to other task usage categories, such as manual, social, and abstract, and to a longer time period, of ten years. We also take into account the task distance between jobs. It might be that more routine-intensive jobs differ more in terms of task usage from other jobs than less routine-intensive jobs.

Another recent study is Robinson (2018), who creates measures of task distance and direction between different occupations and shows that wage losses within three years after displacement are strongly related to the distance and direction of task usage. He finds that the overall negative effect of task distance on wage is mostly due to the negative effect for mobility in a negative direction. He compares displaced workers to other displaced workers, which poses potential selection issues. Our data with detailed task usage and plant closures allows us to study whether it is a particular task usage category, such as social task usage, or distance that matters and to compare displaced workers to non-displaced ones also in the long term.

Several studies have also focused on the reasons for the magnitude and persistence of the earnings loss. Davis and Von Wachter (2011) show how the leading models of the labor market, including that of Mortensen and Pissarides (1994) and its variants, fail to explain losses as large as are observed in the data. One reason for this is that the basic models entail no heterogeneity of productivity, match surplus values, or wages, which all seem to be important factors for generating large earnings losses due to job loss. Our paper is also related to the literature on the portability of skills in the labor market. Gathmann and Schönberg (2010) study the degree to which skills accumulated

in the labor market are portable. They find that individuals move to occupations with similar task usage and the distance declines with experience. They also show that it is an important source of individual wage growth.

The remainder of the paper proceeds as follows. Section 2 presents the data and the task usage variables and categories and explains how we define plant closures. Section 3 presents our empirical strategy. Section 4 presents the results. In section 5, we present our robustness analysis. Finally, in section 6, we conclude.

2 Data and task usage

2.1 EWCS data for task usage

We use the European Working Conditions Survey (EWCS) data for the year 2005 for Finland and Sweden to define the task content of each job (i.e., a one-digit occupation in a one-digit industry).[3] Examples of a job would include a clerical support worker in real estate activities, or a plant and machine operator in mining, quarrying, and manufacturing.

The tasks are divided into four different categories: 1) manual (i.e., non-routine manual), 2) routine (i.e., routine manual and routine cognitive), 3) abstract (i.e., non-routine cognitive), and 4) social tasks (i.e., team work and dealing with people). We follow closely the approach taken in Eurofound (2016) (see Fernández-Macías et al., 2016) in creating the task variables. We use data for both Finland and Sweden in order to have more data and more precise measures of task usage for each job. Finland and Sweden are very similar countries and the analyses in Fernández-Macías et al. (2016) show that the task measures vary little by country.

[3]The European Working Conditions Survey (EWCS) is a survey conducted by the European Foundation for the Improvement of Living and Working Conditions (Eurofound). It aims to assess the working conditions and job quality of workers in European countries, identify relationships between different indicators of working conditions and job quality, and study how working conditions and job quality evolve over time. The survey has been conducted six times to date: in 1991, 1995, 2001/2001, 2005, 2010 and 2015. The survey samples in each participating country are representative of the population of employed individuals aged 15 and older who live in private households and had done at least one hour of paid work during the week preceding the interview.

We use 22 different subcomponents, or survey items, to construct the four task usage categories. A complete list of these subcomponents (i.e., the survey items and possible answers to them), can be found in Table A1. Manual tasks are measured with three items that measure 1) vibrations from handtools, machinery etc.; 2) tiring positions; 3) carrying or moving heavy loads. This measure of manual tasks is quite similar to the one used by Autor and Handel (2013). Routine tasks are defined by nine items, which measure repetitive movements, repetitive tasks, constraints on pace of work, and monotonous tasks. These measures are similar to what have been used in the previous literature (e.g., Acemoglu and Autor, 2011; Autor and Handel, 2013). Abstract tasks are measured with five items that cover 1) assessing the quality of one's own work; 2) problem solving; 3) complex tasks; 4) learning new things; and 5) applying one's own ideas. This measure captures complex problem solving and creative thinking and thus captures tasks similar to the abstract task measure used in Acemoglu and Autor (2011) and Autor and Handel (2013). Social tasks are measured by 1) the amount of interaction with people and 2) four measures capturing autonomy of team work. There are very few papers in the literature measuring social tasks and measures of working with others are sometimes included in the measure of routine tasks (e.g., Autor and Handel, 2013). Our measure is cruder than the measure in Deming (2017), but by including measures of team work, it captures tasks that are similar to his measure (see Deming, 2017, footnote 20). We modify the answers to the survey items to give them the values of 0 or 1, or between 0 and 1, depending on the question, as shown in Table A1. We then take the average of these modified variables as a measure of task intensity.

In Table 1, we summarize the task usage for different occupations in our sample to compare our classification to prior literature. As can be seen from Table 1, occupations differ in both the level and the combination of different tasks used. The ranking of occupations in terms of routine intensity is similar to Goos et al. (2014) and Autor and Dorn (2013). For example, managers and professionals are both occupations that have fewer routine tasks compared to the average across all occupations whereas plant and machine operators have more. Concerning manual task usage and abstract task usage, we find a

ranking of occupations that is similar to that given in Autor and Dorn (2013). Managers and professionals have many abstract tasks and few manual tasks, whereas plant and machine operators, for instance, have many manual tasks, but few abstract tasks. Comparing social tasks is more difficult, because the use of social skills has not been reported by occupation in the prior literature. However, in Table 2 of Autor and Handel (2013), sales and service workers score high on their measure on having a lot of face-to-face contact, which is similar to our measure.

In order to describe the similarity of the jobs, we calculate the distance in task usage between jobs using the Euclidean distance as follows:

$$Distance(j, j^{'}) = \sqrt{\sum_{s=1}^{15}(c_{s,j'} - c_{s,j})^2} \quad (1)$$

In equation 1, the Euclidean distance between two jobs j and $j^{'}$ is the square root of the sum of distances squared between each one of the 15 subcomponents s. There are 15 subcomponents because we have merged some of the 22 components together due to high correlation (see Table A1 for more details).[4] We have used weights so that each higher category—manual task usage, for example—has the same weight (i.e., we have divided the distance by the number of subcomponents used). A complete list of the subcomponents can be found in Table A1. The Euclidean distance varies between 0.12 and 1.53 with a standard deviation of 0.24 between the 9,786 different job combinations.[5] The occupation and industry codes allow us to specify jobs for all employed individuals.

2.2 Plant closures

Our primary data set is the Finnish linked employer-employee data (FLEED) set, which covers all Finnish residents between the ages of 16 and 70 years in the period 1988–2016. We use the years 2001-2016 because occupational codes are not available for all years before 2004. The unique person identification codes allow us to follow individuals over

[4] Our results are robust to using different distance measures, such as the angular distance used in Gathmann and Schönberg (2010).

[5] The quartiles are as follows: q1: 0.40, q2: 0.56, q3: 0.73. Identical job pairs are not included in the descriptive statistics.

time. Likewise, unique firm and plant codes allow us to identify each worker's employer and to examine whether their plant is closing down. We focus on individuals who were working in private sector plants in Finland in 2004–2006.[6] We label these years "base years" b. We construct separate samples for each base year b by including observations of each worker three years prior to the base year b and ten years after. In the analyses we pool these two base-year samples to a panel spanning the years 2001–2016.

In line with earlier studies, displaced workers are understood to be individuals who involuntarily separate from their jobs due to exogenous shocks. We label workers "displaced" if their plant closed down during b and $b+1$, or if they separated from a plant during b and $b+1$ that closed down the next year, that is, between $b+1$ and $b+2$ ("early leavers"). The comparison group consists of all workers who were not displaced between years b and $b+1$. Importantly, we allow workers in the control group to separate for reasons other than displacement, including voluntary job changes and sickness (Krolikowski, 2018). In order to ensure that the treatment and control groups are as similar as possible, we restrict the plant size to be fewer than 500 workers and require the workers to be 20 to 50 years old in base year b. We have roughly 29,000 plants in the base years. Our approach follows closely the approach taken in Huttunen et al. (2011); Huttunen and Riukula (2018).

2.3 Descriptive evidence

Table 2 describes the background characteristics of the displaced and non-displaced workers in our sample. By most characteristics workers who have experienced a plant closure look very similar to the workers who did not experience a job loss during the period. Their age, education, work experience, marital status, number of children and earnings look similar. Earnings are measured as annual taxable labor income and missing earnings are coded as zero. Earnings are deflated to 2013 euros using the national consumer price index. Displaced workers worked in smaller plants and had a slightly

[6] We concentrate on these years as the occupational code was not available yearly before 2004. In some cases, we do not have pre-base-year occupational codes. Missing occupational codes for these years are replaced with occupational code of the following year.

lower tenure. We have also summarized the task usage in pre-displacement year, $t = 0$, by displacement status. The displaced workers work in jobs that are a bit less routine- and manual-intensive, but include more social tasks.

A large proportion of the displaced workers, 28%, work in the manufacturing sector [7] while 35% of the non-displaced workers also work in that industry, as shown in Table A2. Real estate activities come second with 19% of displaced workers working there. Almost 40% of the displaced workers work as either professionals or technicians and associate professionals, as shown in Table 3.

In Figures A1 and A2, we plot selected labor market statistics by time and displacement status. It can be seen from Figure A1 that displaced workers are quite similar to their non-displaced counterparts in terms of their earnings and employment before their job losses. Employment refers to the employment status at the last week of the year. After the job loss occurs, a gap opens in employment and earnings. This gap is persistent for employment and earnings, but though in the case of earnings, if employed, it converges considerably after three years.

From Figure A2 we can see that workers in general do not stick to the same job. Three years after the displacement, roughly 50% of those who were displaced and managed to find a new job, remain in the same occupation in the same industry that they were in before being displaced. Neither do those who were not displaced—but could otherwise change jobs or lose their jobs due to different reasons—stay in the same job; around 60% of the non-displaced workers who are employed work in the same job after three years. The gap that opens after displacement is persistent. We can still see a difference between displaced and non-displaced workers in the probability of having the same job after ten years.

A natural question is whether these individuals change to jobs that differ from their base year jobs in terms of task usage and wages. As can be seen from Figures A2 and A3, the only gap that converges is the probability that the job has lower median earnings than the base year job. Otherwise, displaced workers work in different jobs and occupations,

[7] The manufacturing sector also includes mining

as well as in jobs that are farther away in their task usage than their base job.

3 Empirical strategy

Our empirical strategy consists of two parts. First, we study how job loss affects employment, earnings, and task usage, and whether the effect differs by certain task intensity—for example, whether routine and social-intensive workers face different shocks. Second, we study how task usage contributes to the employment and earnings scar.

3.1 Labor market outcomes

In order to estimate the labor market and task usage effects of job loss, we estimate an event-study style fixed effect regression in which the outcome is a labor market outcome (i.e., earnings, employment, or the job's task usage):

$$Y_{ibt} = \alpha_{ib} + \beta X_{ibt} + \sum_{j=-3}^{10} \delta_j D_{b,t-j} + \gamma_t + \epsilon_{ibt} \tag{2}$$

In equation 2, Y_{ibt} is outcome variable for worker i in base year sample b at time t. The variables $D_{(bt-j)}$ are the variables of main interest. These are dummy variables indicating whether a displacement occurred in year $t-j$, t being the observation year. The associated parameters measure, for example the earnings differentials of displaced workers relative to the non-displaced workers in pre- and post-displacement years $j \in [-3, ..., 10]$. We use the period $t-3$ as the base line and thus drop the displacement dummy for this year.

The specification also includes base-year specific time dummies, γ_t, to ensure that we compare the earnings of displaced and non-displaced workers in the same base-year sample and with the same distance to the base year (-3 to 10). Finally, we also include base-year specific individual fixed effects, α_{ib}, to control for permanent differences in earnings between displaced and non-displaced workers (in a given base year b). When including worker-base-year fixed effects, we cannot include any time-invariant base-year controls, but X_{ibt} includes current year age and age squared. We cluster standard errors

by individual i to allow for the correlation of the error terms, ϵ_{ibt}, across different time periods t and base years b for individual i.

3.2 Determinants of the employment and earnings scar

After examining how job loss affects several job-related outcomes, we quantify how different base-year characteristics of the worker and her job, including task usage, affect the earnings loss. We use the following specification:

$$Y_{ib+t} = \delta D_{ib} + (\delta_g D_{ib} \times G_{ib}) + \beta Z_{ib} + \gamma_b + \epsilon_{ib} \tag{3}$$

Y_{ib+t} is the outcome variable for worker i in base-year sample b at time $b+t$. In our main specification, we estimate the equation for year $b+5$. D_{ib} is a dummy indicating whether worker i was displaced between b and $b+1$. In order to analyze the heterogeneity of the earnings loss, we interact the displacement dummy with various variables that might affect the resulting earnings loss (G_{ib}). These variables include pre-displacement variables such as education category, age, tenure, occupation, task usage in the base job and the task distance of the base job to other jobs.

Following Robinson (2018), we estimate a specification in which we add interactions of the displacement dummy with the destination job characteristics (i.e., whether the occupation is the same) and the task distance between the base job and the destination job. Although destination job characteristics are endogenous, adding them might give a better understanding on the heterogeneity of the earnings loss and which factors might contribute the most to it.

Z_{ib} is a vector of observable pre-displacement worker, plant, and occupation characteristics measured in the base year b. We include age, age squared, secondary and tertiary education dummies, tenure, marriage dummy, base-year earnings, plant size, indicators for industry and province. Base year fixed effects γ_b are included. In the specification in which we add interactions with, for example, job characteristics, we also add the corresponding variables as controls.

4 Results

4.1 Job loss and employment, earnings and task usage

We first show how job displacement affects employment. We then turn our attention to those who are employed, as we can only see the task usage and the occupation codes for individuals who are employed in a given year. We acknowledge that the sample might be positively selected in this case; individuals who manage to get a job after being displaced are most probably of higher ability and the effect of job displacement on their earnings might therefore even be positive.

In Figure 1, we plot the fixed effect (FE) estimates and the 95% confidence intervals for the job displacements dummies from equation 2. The job displacement occurs between b and $b+1$. The upper left panel in Figure 1 shows that displaced workers suffer from a long-lasting drop in employment. Initially, the employment drops by almost 10 pp but over time the gap shrinks to about 2 pp.

The displaced workers also experience a drop in earnings, even if they manage to find a new job. Their earnings do not converge to the non-displaced levels even after ten years. In the long-term, the annual earnings drop by about 4 percent, if employed. These results are qualitatively similar to the results reported in, for example, Huttunen et al. (2011).

The results indicate that job loss results in a long-lasting decrease in earnings even if the worker manages to find a job. Next, we study the impact of job displacement on task usage and occupation. We start by studying a summary measure of task usage, the Euclidean distance, as defined in equation 1. The lower left panel of Figure 1 shows that the Euclidean distance increases noticeably following job displacement, meaning that the tasks of the displaced change more than those of the non-displaced. There is some convergence over time, but even ten years after the displacement, the distance to the origin job in the task space is significant. The lower left panel of Figure 1 shows that workers change to different jobs and occupations more often after being displaced. While the effect decreases over time, there is still a 10 pp decrease in the probability of

having the same job ten years after displacement.

Figure 2 shows the detailed results for the effect of job displacement on task usage. The upper left panel shows that manual task usage increases initially, but then starts to decrease three years after the displacement. The upper right panel shows that routine task usage decreases steadily following displacement and the lower left panel shows that abstract task usage increases following displacement and stays roughly constant after the second year. The lower right panel shows that abstract task usage initially increases markedly and settles at a remarkably high level after the third post-displacement year.

The converging nature of the job-related outcomes we have been looking at might be due to at least four different reasons. First, it might be that the displaced workers at first have hard time finding a good match for their previous task usage but find a better match as time passes. Second, it might be that some of the workers do not find a job during the first years and hence, are not in the data, but later find jobs that match their previous task usage. Third, it might be that the non-displaced workers also change jobs (to jobs that are similar to those the displaced workers find), but do it later because they were not displaced. Finally, fourth, it might also be that the most "capable" individuals find jobs first and drive the results. In Figures A4, A5 and A6, we have plotted some selected base-year characteristics for those who are employed in order to see how the sample is selected each year after job loss. The share of those who have a higher wage residual in the base year and with tertiary education increases after the job loss [8]. Moreover, the number of those with higher usage of abstract and social task usage increases in the first couple of years, which might partly explain the increase we can see in task usage.

4.2 Routine-, social-, abstract-, and manual-intensive jobs

We further explore the role of task usage for the cost of job loss by studying four distinct groups: employees in routine-, social-, abstract-, and manual-intensive jobs in the base year. We define a job as intensive in task if the task usage is in the top quartile in our

[8] Wage residual is calculated as follows. First, we regress worker's earnings at time 0 on age, tenure, experience, base year, occupation, industry and province indicators, and educational dummies (primary or secondary). Then, we calculate the residuals from the regression.

sample. Hence, the group always includes roughly 25% of the sample.

Routine-intensive workers work most often as plant and machine operators and assemblers or are in elementary occupations in the manufacturing sector, but also work in elementary occupations in the transport, storage, and communications sector. Socially intensive workers work also most often as plant and machine operators and assemblers but in the transport, storage, and communications sector. They also often work as service and sales operators in the wholesale and retail trade sector. Abstract-intensive workers are most typically managers or associate professionals in the construction and real estate sectors. Manual-intensive workers are typically craft and related workers or elementary workers in manufacturing or construction.

These four groups differ in their base-year characteristics. Table A3 shows that routine-intensive workers tend to be male, have more tenure and experience, have a low level of education, have high wage residual and work in larger plants. Social-intensive workers tend to be female, have less tenure and experience than routine- or manual-intensive workers, and work in smaller plants. Abstract-intensive workers have the highest earnings and level of education and similar tenure and experience as social-intensive workers. Their wage residual is negative and similar to social-intensive workers. Manual-intensive workers are predominantly male and have experience and tenure that is similar to routine-intensive workers. They also have positive wage residuals.

Figure 3 shows the effect of displacement on employment for the four groups. In the regressions we include only those who are intensive in only one task category in order not to have the same individual in two or more groups.[9] It can be seen from the figure that for abstract- and social-intensive workers there is only a very small impact on employment. The impact is less than 4 pp, even in the first year following the displacement. The results are very different for routine- and manual-intensive workers. The initial decline in employment exceeds 30 pp for routine-intensive workers and is about 20 pp for manual-intensive workers. Even ten years after the displacement, the impact on employment is about 10 pp.

[9]Dropping those in two or more groups leaves us with about 60% of the workers.

The results for the effect of displacement on log earnings, if employed, are displayed in Figure 4. The figure shows that routine-intensive workers face the largest losses. Their earnings drop initially by about 30 percent and in the longer term the wage loss is about 20 percent. The other groups fare better, especially social-intensive workers, for whom there is little evidence of earnings loss. The initial drop in earnings is larger for manual- and abstract-intensive workers, but over the longer term the earnings loss is less than 10 percent for both of these groups.

Figure 5 shows the effect of displacement on task usage for the four groups. The change in task usage is measured with Euclidean distance between the origin and destination jobs. The figure shows that routine-intensive workers move farthest away in the task space from their origin job, followed by manual-intensive, abstract-intensive and social-intensive workers.

These results suggest that the cost of job loss is linked to task usage. The above figures show, for example, that social-intensive workers do not really experience employment or earnings loss. However, we do not know whether the non-existence of the earnings loss, if employed, for social-intensive workers is due to the fact that they have high social task usage or to the fact that their task usage in their origin and destination jobs is similar. Moreover, the distance between the origin job and other jobs is smaller for social-intensive workers, which might contribute to the smaller employment shock they face, as shown in A3. Next, we will estimate regressions in which we interact the displacement dummy with various job and worker characteristics in order to give us a better idea on what might contribute the most to the magnitude of earnings loss.

4.3 Determinants of the employment and earnings scar

As seen above, job displacement results in a drop in employment, earnings loss, and a change in task usage and occupation. Moreover, workers who are displaced move to jobs with a different task structure. Next, using the specification given in equation 3, we analyze how the earnings loss is associated with worker and job characteristics and which of these factors might contribute to the employment and earnings loss.

We report the results in Table 4.[10] The dependent variable is the probability of being employed in year $b+5$ (five years after the displacement). We focus on year $b+5$ as most of the outcomes have started to converge at that time, as shown in the previous subsection. From column (1), we see that displacement decreases employment by -2.8 pp in year $b+5$. In columns (2)–(4), we analyze how different observable pre-displacement characteristics are associated with the employment loss by including interaction terms between displacement and task usage. We see in column (2) that displaced workers with high levels of social task usage have a higher probability of being employed after five years. A one-standard-deviation higher social task usage than on average increases the probability of being employed by 1.6 pp and is significant at the 1-percent significance level. It is also seen from column (2) that one standard deviation higher manual task usage decreases the probability of employment by 1.4 pp. The estimated coefficients for routine and abstract task usage are close to zero and statistically insignificant. In column (3), we test whether the task distance between the origin job and other jobs matters for the probability of being employed in year $b+5$. We find a negative effect of 1.9 pp. That is, a distance that is one standard deviation higher decreases the probability of being employed by 1.9 pp. However, column (4) shows that when task usage is added, the effect of distance becomes positive, yet small and imprecise. This means that what matters for employment prospects after displacement is not how far away in the task space from other jobs the origin job is, but more which tasks were carried out in the origin job.

In Table 5, we look at log annual earnings, if employed. [11] We see from in (1) that on average the earnings loss, if employed, is about 3 percent. Column (2) shows that social task usage one-standard-deviation higher than average increases annual earnings, if employed, by 2.4 percent and is significant at the 1-percent significance level. On the contrary, routine task one-standard-deviation higher than average decreases annual earnings, if employed, by 3.8 percent and is significant at the 1-percent significance level. The coefficients on manual and abstract task usage are small and statistically insignificant.

[10] Full results are presented in Table A4.
[11] Full results are presented in Table A5.

Taken together with the results in Table 4, the results show that employees in jobs with high social task usage experience only small losses from displacement because they are more likely to be employed at $b+5$ and their wage loss is smaller, if employed. Employees in routine-intensive jobs face larger losses from displacement as their wage loss is larger. In contrast, employees in manual-intensive jobs experience larger losses because they are less likely to be employed in $b+5$.

Column (3) shows that the larger the task distance between the origin job and other jobs, the larger the cost of job loss is. However, similarly to the employment results, column (4) shows that when task usage variables are added, the effect of distance becomes positive, yet small and imprecise. Thus, for wage losses following displacement also, the task content matters and not how far away in the task space the origin job is from other jobs.

Robinson (2018) shows that wage losses within three years after displacement are strongly related to the distance and direction of task usage. In column (5) we do a similar analysis by including a measure of Euclidean distance in the task space between the origin and destination job. The results show that the distance between the jobs is associated with lower earnings. A one-standard-deviation increase in the Euclidean distance is associated with a decrease of 1.8 pp in earnings, if employed. In column (6), we have added all variables, including the distance between the origin and destination job. Now we can see that when routine task usage is one standard deviation higher than average, it decreases annual earnings, if employed, by 3.7 percent, while social task usage increases earnings by 2.3 percent. As before, distance matters for earnings only if we do not control for task usage. Moreover, taking task usage in the origin job into account, the effect of distance between the origin and destination job now has a smaller association, of around 0.9 pp.

5 Robustness

In this section we analyze the sensitivity of our results to various subsamples and specifications. First, we take only workers who work in plants that have both routine- and

social-intensive workers, since we find the clearest effects for these groups. It might be that workers who work in, for example, social-intensive jobs work in specific areas or plants and hence, face different macroeconomic conditions and also a different labor market, which might in turn be driving our results. Second, we add base municipality fixed effects to control for labor market conditions in a very specific region. Third, to see how the results differ by the thickness of the labor market we divide our sample into the Helsinki capital region and to other regions. Fourth, we divide the sample into workers who work in small plants (fewer than 50 workers) and in large plants (50 or more workers). Fifth, we interact the displacement dummy with base-year wage residuals to see whether routine-intensive workers merely lose their positive wage residuals and that is what drives their larger earnings losses. Finally, we study the long-term effects of job loss.

We start by considering plants with both routine- and social-intensive workers. We cannot add plant fixed effects in order to see whether it is the plant or the task usage that matters the most as we would not be able to compare displaced and non-displaced workers (by definition, they work in different plants). So, as a complementary approach, we take plants that include both routine-intensive and social-intensive workers. The sample is now smaller, comprising roughly 290,000 workers. In column (1) in Table A6 we see that displacement decreases employment by -5.3 pp in year $b+5$, or five years after the displacement, which is larger than for the whole sample. Social task usage one standard deviation higher than average increases the probability of being employed by 3.4 pp and is significant at the 1-percent significance level (compared to the main specification's 1.6 pp). The other results are very similar to Table 4 in magnitude and statistical significance.

In Table A7, we have the estimates for earnings, if employed. Social task usage one standard deviation higher than average increases annual earnings, if employed, by 5.2 pp and is significant at the 1-percent significance level. On the contrary, one standard deviation higher routine task usage than average decreases annual earnings, if employed, by 5.5 pp and is significant at the 1-percent significance level. These results are similar, but somewhat larger in absolute value than the corresponding results in Table 5.

Next, we consider municipality fixed effects in ordere to compare non-displaced and displaced individuals who live in the same municipality in the base year. All together, there are 434 municipalities in the base years. When adding base municipality fixed effects to the regressions, the results remain virtually the same, as can be seen from Tables A8 and A9.

The thickness of the labor market likely affects the magnitude of the effect displacement. We expect to see a smaller scarring effect and also smaller estimates on the effect of task usage on employment and earnings in a thick labor market in which workers find jobs and match better. The results for the Helsinki capital region (a thick labor market) can be seen in Tables A10 and A11. As expected the shock resulting from job loss is smaller in magnitude in the Helsinki region, where the labor market is thicker: job displacement results in a 1.3 pp decrease in employment five years after job loss, which is over 50% smaller than for the whole sample. The effect of task usage on employment does not differ from Table 4, with the exception of social task usage, whose coefficient drops close to zero. The cost of job loss in terms of log earnings, if employed, is also smaller in Table A11 compared to Table 5. The coefficients on task usage are similar to the main specification, but slightly smaller.

On the contrary, for other regions with thinner labor markets in general, the employment and earnings shocks are larger in size. The results for other regions can be seen in Tables A12 and A13. Job loss results in a 3.8 pp decrease in employment five years after job loss, which is larger than in the main specification. The coefficients on the task usage variables are quite similar to the main specification. The earnings loss is larger in Table A13 compared to Table 5, but the coefficients on the task usage variables are again quite similar.

Routine-intensive workers work in larger plants on average, so it therefore is possible that they face more competition after being displaced and that drives our results. We have controlled for the size of the plant in our main specification. We now divide the sample into workers who work in small plants (fewer than 50 workers) and in large plants (50 or more workers). Around 500,000 workers work in small plants and 600,000 work in large

plants.

The results for workers in small plants can be seen in Tables A14 and A15. Job displacement results in a 1.8 pp decrease in employment five years after job loss, which is smaller than for the whole sample (2.8 pp). The coefficients on task usage are similar to the main specification. The earnings loss is smaller in small plants compared to the main specification (1.5 percent versus 3.1 percent). The results for task usage differ in that the coefficients on manual and abstract task usage are larger in absolute value.

The results for workers in large plants, or plants with 50 or more workers, can be seen in Tables A16 and A17. Job displacement results in a 3.6 pp decrease in employment five years after job loss, which is larger than for the whole sample (2.8 pp) and is as expected. The results concerning task usage and employment are similar to the main specification. The earnings loss is also larger in larger plants compared to the main specification (4.2 percent versus 3.1 percent). The coefficients on task usage variables are somewhat larger in magnitude compared to the main specification.

In Tables A18 and A19, we interact the displacement dummy with base-year wage residuals to see, whether routine-intensive workers merely lose their larger wage residuals and that is what drives their earnings loss. The results concerning task usage are similar to the main specification. Wage residual has a positive effect on both the probability of finding a new job and on log earnings, if employed. A wage residual one standard deviation higher increases the probability of being employed in $b+5$ by 0.9 pp and log earnings, if employed, by 2.3 pp. Our measure of wage residual thus seems to capture ability and affects future labor market outcomes positively.

We have looked at the outcomes five years after the job loss and can expect that most of the workers have adjusted to it. However, it is interesting to see whether we can see the effects of task usage after ten years. We might expect that task usage matters more with respect to earnings, if employed, the farther we go in time, as social-intensive workers, for example, got back to the labor market faster and did not experience such a large loss in earnings in the first place, whereas routine-intensive workers experienced a cut in their wages, if employed.

We report the results in Table A20. The dependent variable is the probability of being employed in year $b+10$. From column (1), we see that displacement decreases employment by -1.8 pp, or by 2.1 percent, ten years after the displacement. The effect is now smaller than five years after job loss, which was roughly -3 percent. The effect of social task usage on employment is persistent. Social task usage one standard deviation higher than average increases the probability of being employed by 1.0 pp, or by 1.2 percent, and is significant at the 1-percent level even when controlling for other factors, such as origin occupation. Interestingly, we can now see a positive effect of distance from origin job to other jobs even after controlling for task usage and occupation. A distance one standard deviation higher from origin job to other jobs than average increases the probability of being employed by 0.9 pp and is significant at the 5-percent significance level.

In Table A21, we look at earnings, if employed, ten years after the job loss event. The effects of task usage are persistent with respect to routine task usage and social task usage. The effect of social task usage on earnings is smaller and less precise compared to Table 5. On the other hand, routine task usage one standard deviation higher than average decreases annual earnings, if employed, by 3.2 pp and is significant at the 1-percent significance level, which is similar to the main specification's 3.8 pp. Task usage thus also matters in the long term, especially in the case of routine task usage. In the long run distance between origin and destination job is positively yet imprecisely associated with earnings, if employed, when the task usage in the origin job is taken into account.

6 Conclusions

Job displacement leads, on average, to persistent earnings losses, even for those who are re-employed. Previous literature has shown that the cost of job loss is heterogeneous, and some workers are actually better off after displacement. The theoretical reasons for the cost of job loss and its heterogeneity are still unclear, although specific human capital and matching theories seem best equipped to explain both the extent and the heterogeneity

of the losses. Recent technological change, which alters the demand and rewards for different tasks in the labor market, also affects the cost of job loss.

We study the heterogeneity of the cost of job loss by focusing on the task usage in the origin jobs. Task usage is important for both the specific human capital and the matching explanation for the cost of job loss. More specifically, we study whether workers who involuntarily lose their jobs face different shocks depending on their initial task usage. Do routine-intensive workers, for example, pay a penalty with lower wage levels? We use plant closures to identify those who lose jobs involuntarily due to exogenous shocks and follow them for three years before and ten years after job displacement. To understand how task usage affects the cost of job loss, we ask: do earnings losses after job loss differ in relation to task usage?

We find that workers who lose jobs due to plant closures suffer from persistent earnings losses, which is in line with the previous studies. Workers in origin jobs with high levels of social tasks have a higher probability of being re-employed. Distance between the origin job and other jobs has a negative effect on the probability of finding a new job and earnings, if employed. Interestingly, the distance in task usage between the origin job and other jobs does not matter when task usage (i.e., usage of manual, social, routine and social tasks), is taken into account. Workers in routine-intensive jobs suffer from large and persistent earnings losses, if employed, while workers in social-intensive jobs do not suffer from earnings losses, if employed. The results concerning the routine-intensive workers are consistent with Blien et al. (2017).

We further investigate whether the distance in task usage between origin and destination job task usage is associated with wage loss. Robinson (2018) shows that the overall negative effect of distance on wages is only due to the negative effect for mobility in a negative direction.[12] We find that the distance between origin and destination job has a negative association with earnings, if employed, after five years. On the other hand, we find a positive, yet imprecise and small, association with earnings, if employed, and distance after ten years.

[12] Our task measures are such that it is not meaningful to look at the direction of the move.

References

Acemoglu, D., and Autor, D. (2011). "Skills, Tasks and Technologies: Implications for Employment and Earnings." In *Handbook of Labor Economics*, vol. 4, 1043–1171, Elsevier.

Addison, J. T., and Portugal, P. (1989). "Job displacement, relative wage changes, and duration of unemployment." *Journal of Labor Economics*, *7*(3), 281–302.

Autor, D., and Dorn, D. (2013). "The growth of low-skill service jobs and the polarization of the us labor market." *American Economic Review*, *103*(5), 1553–97.

Autor, D. H., and Handel, M. J. (2013). "Putting Tasks to the Test: Human capital, Job tasks, and Wages." *Journal of Labor Economics*, *31*(S1), S59–S96.

Blien, U., Dauth, W., and Roth, D. (2017). "Routine tasks and recovery from mass layoffs." Tech. rep.

Carrington, W. J., and Fallick, B. (2017). "Why do earnings fall with job displacement?" *Industrial Relations: A Journal of Economy and Society*, *56*(4), 688–722.

Cortes, G. M. (2016). "Where have the middle-wage workers gone? a study of polarization using panel data." *Journal of Labor Economics*, *34*(1), 63–105.

Couch, K. A., and Placzek, D. W. (2010). "Earnings losses of displaced workers revisited." *American Economic Review*, *100*(1), 572–89.

Davis, S. J., and Von Wachter, T. M. (2011). "Recessions and the cost of job loss." Tech. rep., National Bureau of Economic Research.

Deming, D. J. (2017). "The Growing Importance of Social Skills in the Labor Market." *Quarterly Journal of Economics*, *132*(4), 1593–1640.

Eliason, M., and Storrie, D. (2006). "Lasting or latent scars? swedish evidence on the long-term effects of job displacement." *Journal of Labor Economics*, *24*(4), 831–856.

Eurofound (2016). "What do Europeans do at work? A task-based analysis: European Jobs Monitor 2016." Tech. rep., Publications Office of the European Union, Luxembourg.

Fernández-Macías, E., Bisello, M., Sarkar, S., and Torrejón, S. (2016). "Methodology of the Construction of Task Indices for the European Jobs Monitor." Tech. rep., Eurofound.

Gathmann, C., and Schönberg, U. (2010). "How general is human capital? a task-based approach." *Journal of Labor Economics*, *28*(1), 1–49.

Goos, M., Manning, A., and Salomons, A. (2014). "Explaining Job Polarization: Routine-Biased Technological Change and Offshoring." *American Economic Review*, *104*(8), 2509–26.

Hijzen, A., Upward, R., and Wright, P. W. (2010). "The income losses of displaced workers." *Journal of Human Resources*, *45*(1), 243–269.

Huttunen, K., Møen, J., and Salvanes, K. G. (2011). "How destructive is creative destruction? effects of job loss on job mobility, withdrawal and income." *Journal of the European Economic Association*, *9*(5), 840–870.

Huttunen, K., and Riukula, K. (2018). "Parental job loss and children's schooling choices."

Jacobson, L. S., LaLonde, R. J., and Sullivan, D. G. (1993). "Earnings losses of displaced workers." *American Economic Review*, 685–709.

Kambourov, G., and Manovskii, I. (2009). "Occupational specificity of human capital." *International Economic Review*, *50*(1), 63–115.

Krolikowski, P. (2018). "Choosing a control group for displaced workers." *ILR Review*, *71*(5), 1232–1254.

Lazear, E. P. (2009). "Firm-specific human capital: A skill-weights approach." *Journal of Political Economy*, *117*(5), 914–940.

Mortensen, D. T., and Pissarides, C. A. (1994). "Job creation and job destruction in the theory of unemployment." *The Review of Economic Studies*, *61*(3), 397–415.

Robinson, C. (2018). "Occupational mobility, occupation distance, and specific human capital." *Journal of Human Resources*, *53*(2), 513–551.

Stevens, A. H. (1997). "Persistent effects of job displacement: The importance of multiple job losses." *Journal of Labor Economics*, *15*(1, Part 1), 165–188.

Vainiomäki, J. (2018). "Ketkä poistuvat rutiiniammateista ja kuinka se vaikuttaa tulevaan palkkakehitykseen?" *Yhteiskuntapolitiikka*, (3), 272–286.

A Tables and figures

Table 1: Task usage in levels by base occupation in sample

	Manual task usage	Routine task usage	Abstract task usage	Social task usage
Managers	12.10	34.43	91.89	61.86
Professionals	8.96	34.79	85.77	58.44
Technicians and associate professionals	11.66	31.86	82.52	63.11
Clerical support workers	12.77	38.54	77.63	65.26
Service and sales workers	20.36	38.76	76.18	82.92
Craft and related trade workers	40.79	48.49	81.26	58.27
Plant and machine operators and assemblers	29.79	55.14	66.95	51.70
Elementary occupations	30.03	51.98	60.60	60.15

Notes: Sample consists of workers who were 20–50 years old at the time t (base years 2004–06) and who were working in private sector plants with 10–500 workers. Task usage measures have been multiplied by 100.

Table 2: Pre-displacement characteristics

	Displaced mean	Not displaced mean	P-value for difference p
Age	38.17	38.56	0.00
Female	0.41	0.39	0.00
Children under 18	0.94	1.00	0.00
Tenure	4.28	5.39	0.00
Plant size	105.25	107.40	0.01
Primary education	0.15	0.14	0.55
Secondary education	0.46	0.47	0.00
Tertiary education	0.39	0.38	0.01
Experience	15.81	16.45	0.00
Married	0.49	0.51	0.00
Earnings	39530.28	39399.42	0.55
Income	40791.64	40475.16	0.16
Manual task usage	19.87	21.38	0.00
Routine task usage	40.77	41.86	0.00
Abstract task usage	77.90	77.90	0.90
Social task usage	62.38	61.98	0.00
Observations	17180	1093855	1111035

Notes: See Table 1 for table notes.

Table 3: Occupation by displacement status

	All	Displaced	Not displaced
Managers	6.10	5.71	6.11
Professionals	13.99	17.66	13.94
Technicians and associate professionals	19.19	20.66	19.17
Clerical support workers	9.32	8.38	9.34
Service and sales workers	11.60	10.84	11.62
Craft and related trades workers	15.49	11.50	15.56
Plant and machine operators and assemblers	16.85	16.64	16.86
Elementary occupations	7.44	8.61	7.42
Total (%)	100.00	100.00	100.00

Notes: See Table 1 for table notes.

Table 4: The effect of displacement on employment after five years

	(1)	(2)	(3)	(4)
Displaced	-0.028***	-0.030***	-0.028***	-0.030***
	(0.002)	(0.002)	(0.002)	(0.002)
Displaced*Manual task usage		-0.014***		-0.016***
		(0.003)		(0.003)
Displaced*Routine task usage		-0.004		-0.004
		(0.004)		(0.004)
Displaced*Abstract task usage		0.002		0.002
		(0.003)		(0.003)
Displaced*Social task usage		0.016***		0.017***
		(0.002)		(0.003)
Displaced*Origin distance			-0.019***	0.002
			(0.002)	(0.003)
Mean (not displaced)	0.918	0.918	0.918	0.918
Observations	1102755	1102755	1100866	1100866

Notes: Estimation results based on equation 3. The sample consists of workers who were 20–50 years old. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in the base year, base-year annual earnings, education (primary, secondary or tertiary), marriage dummy, base-year fixed effects, plant size, base industry, base occupation and base province. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table 5: The effect of displacement on earnings, if employed, after five years

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.031***	-0.039***	-0.033***	-0.039***	-0.018***	-0.028***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Displaced*Manual task usage		-0.006		-0.009		-0.005
		(0.007)		(0.007)		(0.007)
Displaced*Routine task usage		-0.038***		-0.040***		-0.037***
		(0.007)		(0.008)		(0.008)
Displaced*Abstract task usage		-0.004		-0.003		-0.003
		(0.005)		(0.005)		(0.005)
Displaced*Social task usage		0.024***		0.026***		0.023***
		(0.005)		(0.005)		(0.005)
Displaced*Origin distance			-0.038***	0.008		0.010
			(0.004)	(0.007)		(0.007)
Displaced*Euclidean distance					-0.018***	-0.009**
					(0.004)	(0.004)
Mean (not displaced)	10.527	10.527	10.527	10.527	10.527	10.527
Observations	991559	991559	989773	989773	987047	987047

Notes: See Table 4 for table notes. Sample consists only of those who were employed in $b+5$.

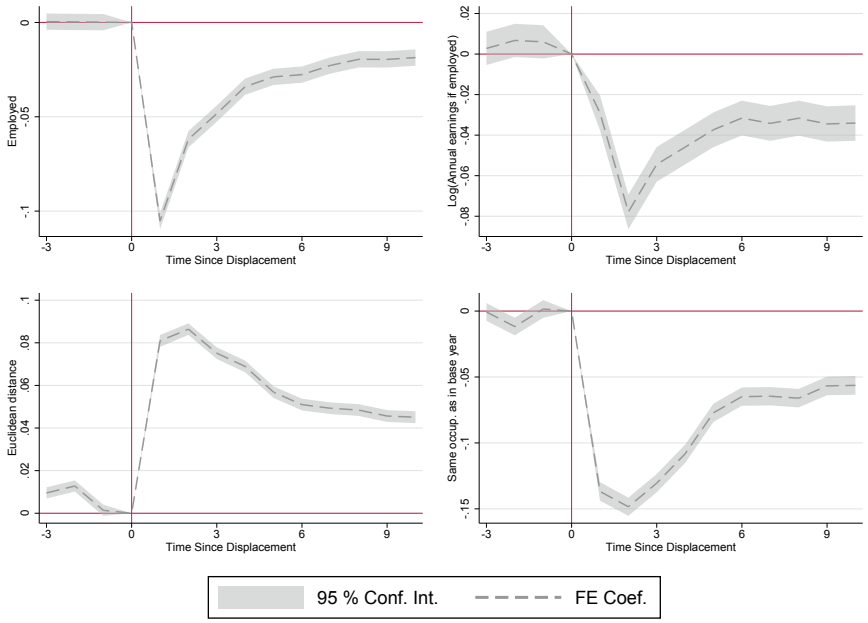

Figure 1: Effect of displacement on labor market outcomes with individual fixed effects

Notes: Figure shows estimation results based on equation 2. The 95% confidence intervals are obtained by clustering standard errors on individuals. Sample consists of workers who were 20–50 years old at time 0 (base-years 2004–06) and who were employed in the end of years 0 and -1. The controls include time dummy x base-year dummy interactions, age, and age squared.

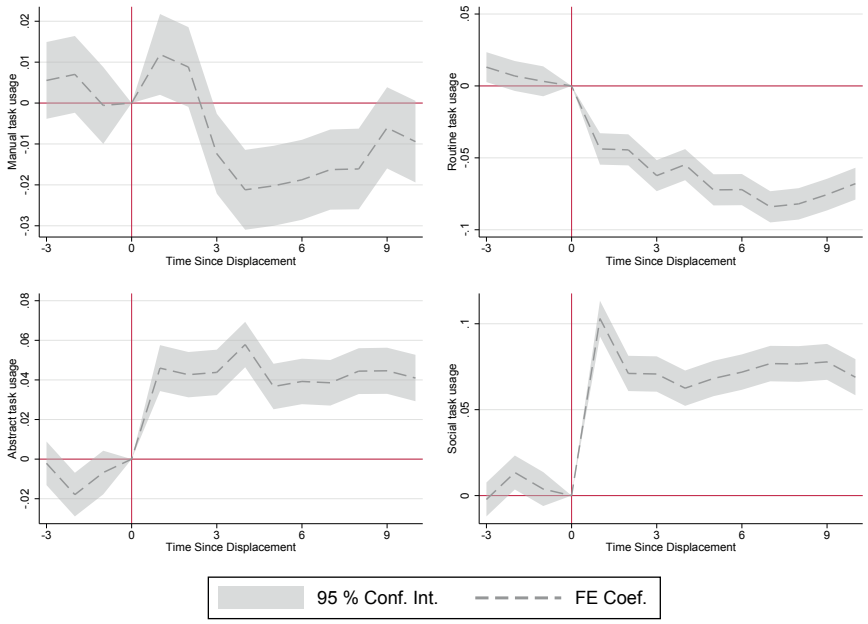

Figure 2: Effect of displacement on task usage with individual fixed effects

Notes: Please see Figure 1 for figure notes.

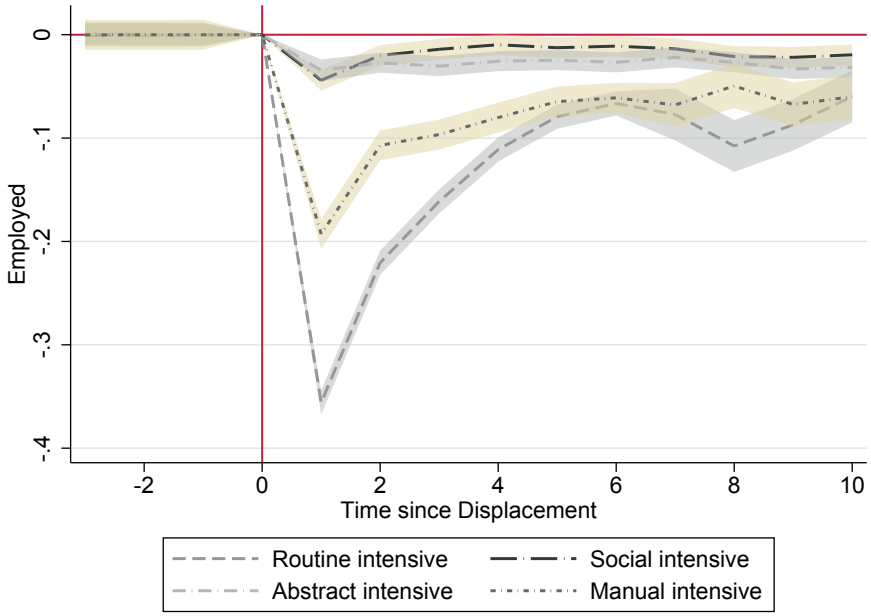

Figure 3: The effect of displacement on employment with individual fixed effects for routine-, social-, abstract- and manual-intensive workers.

Notes: Figure shows estimation results based on equation 2 for routine-intensive (top 25%), social-intensive, abstract-intensive and manual-intensive employees. Only those who were intensive in one task category are included in the analysis. The 95% confidence intervals are obtained by clustering standard errors on individuals. Sample consists of workers who were 20–50 years old at time 0 (base-years 2004–06) and who were employed in the end of years 0 and -1. The controls include time dummy x base-year dummy interactions, age, and age squared. The regressions only include those who were employed in a given time *t*.

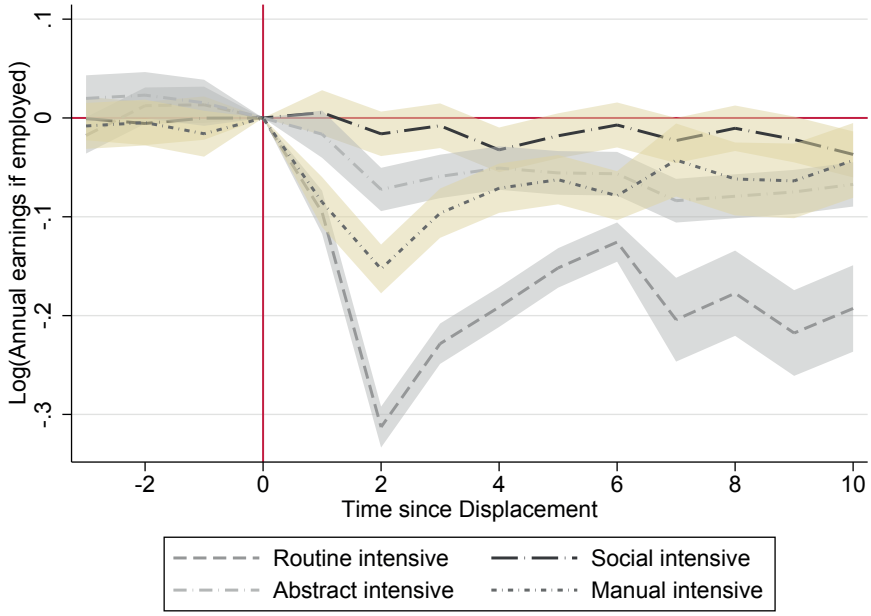

Figure 4: The effect of displacement on log earnings with individual fixed effects for routine-, social-, abstract- and manual-intensive workers.

Notes: Please see Figure 3 for figure notes. Sample includes those who are employed in a given time.

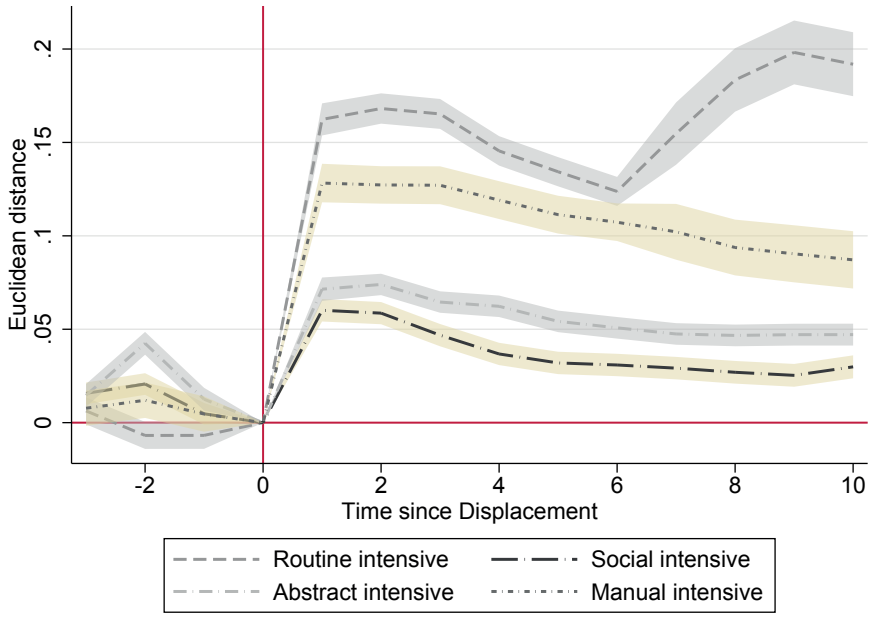

Figure 5: The effect of displacement on task distance with individual fixed effects for routine-, social-, abstract- and manual-intensive workers.

Notes: Please see Figure 3 for figure notes. Sample includes those who were employed in a given time.

(1) Manual tasks (= non-routine manual)				
Job hazards (vibrations)		Q29a	Are you exposed at work to vibrations from hand tools, machinery, etc.	All, Almost all, Around 3/4, Around half, Around 1/4 of the time, Almost never, or Never
Posture-related issues (tiring positions)		Q30a	Does your main paid job involve tiring or painful positions	
Posture-related issues (heavy loads)		Q30c	Does your main paid job involve carrying or moving heavy loads	
(2) Routine tasks (= routine manual + routine cognitive)				
Posture-related issues (repetitive movements)		Q30e	Does your main paid job involve repetitive hand or arm movements	Yes or No
Repetitive tasks (1 minute)		Q48a	Does your job involve short repetitive tasks of less than 1 minute	
Repetitive tasks (10 minutes)		Q48b	Does your job involve short repetitive tasks of less than 10 minutes	
Constraints on pace of work	Due to colleagues	Q50a	Is your pace of work dependent on the work done by colleagues	
	Due to customer demands	Q50b	... direct demands from people such as customers, passengers, pupils, patients, etc.	
	Due to production targets	Q50c	... numerical production targets or performance targets	
	Due to machine speed	Q50d	... automatic speed of a machine or movement of a product	
	Due to boss	Q50e	... the direct control of your boss	
Cognitive dimensions (monotonous tasks)		Q53d	Generally, does your main paid job involve monotonous tasks	
(3) Abstract tasks (= nonroutine cognitive)				
Cognitive dimensions (self assess quality)		Q53b	Generally, does your main paid job involve assessing yourself the quality of your own work	Yes or No
Cognitive dimensions (problem solving)		Q53c	... solving unforeseen problems on your own	
Cognitive dimensions (complex tasks)		Q53e	... complex tasks	
Cognitive dimensions (learning)		Q53f	... learning new things	
Autonomy (apply own ideas)		Q61i	You are able to apply your own ideas in your work	Always, Most of the time, Sometimes, Rarely, or Never
(4) Social skills				
Client work (dealing with people)		Q30f	Does your main paid job involve dealing directly with people who are not employees at your workplace such as customers, passengers, pupils, patients, etc.	All, Almost all, Around 3/4, Around half, Around 1/4 of the time, Almost never, or Never
Working in a team	Teamwork	Q58	Do you work in a group or team that has common tasks and can plan its work?	Yes or No
	Team autonomy (task division)	Q60a	For the team in which you work mostly, do the members decide by themselves on the division of tasks?	
	Team autonomy (head)	Q60b	... who will be head of the team?	
	Team autonomy (timetable)	Q60c	... the timetable of the work?	

Table A1: Task usage and subcomponents

Notes: The variables are modified to take values between 0 to 1 as follows: 1 for All of the time and Always, 0.9 for Almost of all of the time, 0.75 for Around 3/4 of the time, 0.5 for Around half of the time, 0.25 for Around 1/4 of the time, 0.1 for Almost never, 0 for Never, 1 for Yes, 0 for No, 0.8 for Most of the time, 0.5 for Sometimes, and 0.2 for Rarely. Constraints on pace of work variable is defined as the average of the five modified component items. Working in a team variable is defined as the average of the four modified component items. Finally, we define the task variables as averages of the survey items, where the values of each item have been modified to have values between 0 and 1 as defined above.

Table A2: Base year industry by displacement status

	All	Displaced	Not displaced
Mining, Quarring, and Manufacturing	35.17	27.54	35.29
Electricity, gas, and water supply	0.93	0.26	0.94
Construction	6.42	5.87	6.42
Wholesale and retail trade; repair of motor vehicles and motorcycles	16.03	11.78	16.1
Hotels and restaurants	2.81	1.74	2.82
Transport, storage and communication	10.04	17.63	9.92
Financial intermediation	3.13	1.22	3.16
Real estate activities	12.78	19.11	12.68
Public administration and defence; compulsory social security	1.03	1.26	1.02
Education	2.50	4.85	2.46
Health and social work	5.41	7.31	5.38
Other service activities	3.76	1.42	3.8
Total (/%)	100.00	100.00	100

Notes: Sample consists of workers who were 20–50 years old at the time t (base years 2004–06) and who were working in private sector plants with 10–500 workers.

Table A3: Base year characteristics for high and low task intensive workers

	High manual	Low manual	High routine	Low routine	High abstract	Low abstract	High social	Low social
Age	38.21	39.19	37.96	39.35	39.68	38.44	37.83	38.59
Female	0.15	0.51	0.31	0.49	0.32	0.30	0.60	0.29
Children under 18	0.95	1.04	0.90	1.09	1.14	0.91	0.96	0.98
Tenure	5.91	4.79	6.26	4.94	4.92	6.05	4.82	6.31
Plant size	100.80	98.33	141.04	110.36	82.16	136.57	74.69	158.52
Primary education	0.19	0.06	0.25	0.06	0.08	0.27	0.14	0.21
Secondary education	0.74	0.23	0.66	0.32	0.33	0.63	0.51	0.54
Tertiary education	0.06	0.71	0.08	0.61	0.59	0.10	0.34	0.25
Experience	18.28	14.74	18.11	15.06	15.67	18.51	15.20	17.59
Married	0.46	0.57	0.43	0.58	0.59	0.45	0.49	0.49
Annual Earnings (in 1000s)	34.47	47.39	34.12	43.82	51.25	34.00	33.18	38.92
Annual Income (in 1000s)	35.23	48.83	34.99	45.02	52.76	34.82	34.40	39.73
Manual task usage	1.53	-1.10	0.59	-0.85	-0.17	0.48	-0.06	0.28
Routine task usage	0.72	-0.80	1.57	-1.19	-0.48	1.05	-0.27	0.95
Abstract task usage	-0.14	0.73	-1.12	0.80	1.21	-1.45	0.00	-0.77
Social task usage	-0.35	-0.02	-0.80	0.14	0.22	-0.61	1.43	-1.29
Wage residual (in 1000s)	0.63	-0.37	0.57	-0.13	-0.45	0.20	-0.26	0.09
Origin distance	0.47	0.38	0.51	0.38	0.39	0.48	0.38	0.49
Observations	223489	228442	204045	234482	234311	265498	262082	211527

Notes: Sample consists of workers who were 20–50 years old at the time t (base years 2004–06) and who were working in private sector plants with 10–500 workers.

Table A4: The effect of displacement on employment after five years with additional interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Displaced	-0.028***	-0.057***	-0.036***	-0.051***	-0.049***	-0.049***	-0.061***
	(0.002)	(0.006)	(0.009)	(0.006)	(0.006)	(0.006)	(0.010)
Displaced*Age		-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Displaced*Female		0.007*	0.003	0.005	0.003	0.002	0.001
		(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
Displaced*Tenure		-0.004***	-0.002***	-0.003***	-0.002**	-0.002**	-0.001*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Displaced*Secondary education		0.014**	0.013**	0.013**	0.012*	0.012**	0.014**
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Displaced*Tertiary education		0.037***	0.022***	0.031***	0.027***	0.027***	0.023***
		(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Displaced*Manager			-0.011				0.005
			(0.012)				(0.014)
Displaced*Professional			0.012				0.035***
			(0.009)				(0.011)
Displaced*Technicians			-0.007				0.013
			(0.008)				(0.010)
Displaced*Clerical support			0.009				0.033***
			(0.010)				(0.011)
Displaced*Plant and machine operators			-0.048***				-0.004
			(0.009)				(0.012)
Displaced*Craft and related trade			-0.033***				-0.001
			(0.009)				(0.014)
Displaced*Elementary			0.001				0.036***
			(0.010)				(0.013)
Displaced*Origin distance				-0.013***		0.000	0.002
				(0.002)		(0.003)	(0.004)
Displaced*Manual task usage					-0.010***	-0.011***	-0.003
					(0.003)	(0.003)	(0.006)
Displaced*Routine task usage					-0.004	-0.003	-0.006
					(0.004)	(0.004)	(0.004)
Displaced*Abstract task usage					-0.000	-0.000	0.001
					(0.003)	(0.003)	(0.004)
Displaced*Social task usage					0.014***	0.014***	0.015***
					(0.002)	(0.003)	(0.003)
Mean (not displaced)	0.918	0.918	0.918	0.918	0.918	0.918	0.918
Observations	1102755	1102755	1102755	1100866	1102755	1100866	1100866

Notes: Estimation results based on equation 3. The sample consists of workers who were 20–50 years old. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in the base year, base-year annual earnings, education (primary, secondary or tertiary), marriage dummy, base-year fixed effects, plant size, base industry, and base province. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table A5: The effect of displacement on log earnings, if employed, after five years with additional interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Displaced	-0.029***	-0.059***	0.024	-0.048***	-0.038***	-0.039***	-0.019	-0.038***	0.003	-0.013
	(0.004)	(0.012)	(0.018)	(0.012)	(0.012)	(0.012)	(0.021)	(0.012)	(0.005)	(0.021)
Displaced*Age		-0.001	-0.000	-0.001	-0.001	-0.001	-0.001	-0.001*		-0.001
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.001)
Displaced*Female		-0.009	-0.020**	-0.015*	-0.015	-0.014	-0.023**	-0.007		-0.018*
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)		(0.010)
Displaced*Tenure		-0.009***	-0.006***	-0.008***	-0.004**	-0.003**	-0.003**	-0.008***		-0.003*
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)		(0.002)
Displaced*Secondary education		0.023*	0.009	0.019	0.008	0.008	0.010	0.018		0.008
		(0.014)	(0.013)	(0.014)	(0.013)	(0.013)	(0.013)	(0.014)		(0.013)
Displaced*Tertiary education		0.032**	-0.010	0.020	-0.006	-0.007	-0.012	0.020		-0.014
		(0.014)	(0.015)	(0.014)	(0.015)	(0.015)	(0.015)	(0.014)		(0.015)
Displaced*Manager			-0.103***				-0.084***			-0.080***
			(0.023)				(0.028)			(0.028)
Displaced*Professional			-0.004				0.035			0.033
			(0.018)				(0.023)			(0.023)
Displaced*Technicians			-0.027				-0.001			-0.001
			(0.017)				(0.020)			(0.020)
Displaced*Clerical support			-0.002				0.049**			0.055**
			(0.020)				(0.023)			(0.023)
Displaced*Plant and machine op.			-0.151***				-0.062**			-0.047*
			(0.018)				(0.026)			(0.026)
Displaced*Craft and related trade			-0.099***				-0.059**			-0.051*
			(0.020)				(0.029)			(0.029)
Displaced*Elementary			-0.079***				0.003			0.000
			(0.020)				(0.027)			(0.027)
Displaced*Origin distance				-0.028***		0.009	0.011			0.014*
				(0.005)		(0.007)	(0.008)			(0.008)
Displaced*Manual task usage					-0.008	-0.010	0.013			0.014
					(0.007)	(0.007)	(0.011)			(0.011)
Displaced*Routine task usage					-0.038***	-0.042***	-0.040***			-0.039***
					(0.007)	(0.008)	(0.008)			(0.008)
Displaced*Abstract task usage					-0.008	-0.008	0.003			0.004
					(0.006)	(0.006)	(0.008)			(0.008)
Displaced*Social task usage					0.026***	0.029***	0.019***			0.018**
					(0.005)	(0.006)	(0.007)			(0.007)
Displaced*Euclidean distance								-0.019***	-0.033***	-0.008*
								(0.004)	(0.005)	(0.004)
Mean (not displaced)	10.527	10.527	10.527	10.527	10.527	10.527	10.527	10.527	10.527	10.527
Observations	991559	991559	991559	989773	991559	989773	989773	987047	987047	987047

Notes: See Table A4 for table notes. Sample includes those who were employed in $b+5$.

Table A6: The effect of displacement on employment after five years including plants with both routine- and social-intensive workers

	(1)	(2)	(3)	(4)
Displaced	-0.053***	-0.031***	-0.043***	-0.032***
	(0.004)	(0.005)	(0.005)	(0.005)
Displaced*Manual task usage		-0.018**		-0.020**
		(0.008)		(0.008)
Displaced*Routine task usage		-0.004		-0.008
		(0.006)		(0.007)
Displaced*Abstract task usage		0.005		0.004
		(0.006)		(0.006)
Displaced*Social task usage		0.034***		0.036***
		(0.005)		(0.005)
Displaced*Origin distance			-0.019***	0.008
			(0.004)	(0.006)
Mean (not displaced)	0.907	0.907	0.907	0.907
Observations	292471	292471	291698	291698

Notes: Estimation results based on equation 3. The sample consists of workers who were 20–50 years old and working in plants that had both routine- and social-intensive workers. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in the base year, base-year annual earnings, education (primary, secondary or tertiary), marriage dummy, base-year fixed effects, plant size, base industry, base province, and base occupation. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table A7: The effect of displacement on earnings, if employed, after five years including plants with both routine- and social-intensive workers

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.095***	-0.052***	-0.067***	-0.050***	-0.065***	-0.034***
	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)	(0.011)
Displaced*Manual task usage		0.013		0.016		0.021
		(0.015)		(0.016)		(0.015)
Displaced*Routine task usage		-0.055***		-0.040***		-0.036***
		(0.011)		(0.013)		(0.013)
Displaced*Abstract task usage		-0.007		-0.006		-0.002
		(0.012)		(0.012)		(0.012)
Displaced*Social task usage		0.052***		0.047***		0.040***
		(0.009)		(0.009)		(0.009)
Displaced*Origin distance			-0.063***	-0.027**		-0.021*
			(0.008)	(0.012)		(0.012)
Displaced*Euclidean distance					-0.026***	-0.009
					(0.007)	(0.008)
Mean (not displaced)	10.493	10.493	10.493	10.493	10.493	10.493
Observations	260056	260056	259314	259314	258209	258209

Notes: See Table A6 for table notes. Sample includes those who were employed in $b+5$.

Table A8: The effect of displacement on employment after five years including base year municipality fixed effects

	(1)	(2)	(3)	(4)
Displaced	-0.027***	-0.030***	-0.027***	-0.029***
	(0.002)	(0.002)	(0.002)	(0.002)
Displaced*Manual task usage		-0.014***		-0.015***
		(0.003)		(0.003)
Displaced*Routine task usage		-0.004		-0.004
		(0.004)		(0.004)
Displaced*Abstract task usage		0.002		0.002
		(0.003)		(0.003)
Displaced*Social task usage		0.016***		0.016***
		(0.002)		(0.003)
Displaced*Origin distance			-0.018***	0.002
			(0.002)	(0.003)
Mean (not displaced)	0.918	0.918	0.918	0.918
Observations	1102755	1102755	1100866	1100866

Notes: Estimation results based on equation 3. The sample consists of workers who were 20–50 years old. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in the base year, base year annual earnings, education (primary, secondary or tertiary), marriage dummy, base-year fixed effects, plant size, base industry, base province, base occupation, and base year municipality. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table A9: The effect of displacement on log earnings, if employed, after five years including base year municipality fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.032***	-0.040***	-0.034***	-0.040***	-0.019***	-0.029***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Displaced*Manual task usage		-0.007		-0.009		-0.006
		(0.007)		(0.007)		(0.007)
Displaced*Routine task usage		-0.036***		-0.038***		-0.036***
		(0.007)		(0.008)		(0.008)
Displaced*Abstract task usage		-0.003		-0.003		-0.003
		(0.005)		(0.005)		(0.005)
Displaced*Social task usage		0.023***		0.026***		0.023***
		(0.005)		(0.005)		(0.005)
Displaced*Origin distance			-0.037***	0.007		0.010
			(0.004)	(0.007)		(0.007)
Displaced*Euclidean distance					-0.019***	-0.010**
					(0.004)	(0.004)
Mean (not displaced)	10.527	10.527	10.527	10.527	10.527	10.527
Observations	991559	991559	989773	989773	987047	987047

Notes: See Table A8 for table notes. Sample includes those who were employed in $b+5$.

Table A10: The effect of displacement on employment after five years in Helsinki capital region

	(1)	(2)	(3)	(4)
Displaced	-0.013***	-0.017***	-0.015***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
Displaced*Manual task usage		-0.014***		-0.011**
		(0.005)		(0.005)
Displaced*Routine task usage		0.007		0.010*
		(0.005)		(0.005)
Displaced*Abstract task usage		0.002		0.001
		(0.004)		(0.004)
Displaced*Social task usage		0.005		0.001
		(0.004)		(0.004)
Displaced*Origin distance			-0.010***	-0.010**
			(0.003)	(0.005)
Mean (not displaced)	0.931	0.931	0.931	0.931
Observations	354892	354892	354578	354578

Notes: Estimation results based on equation 3. The sample consists of workers who were 20–50 years old working in Helsinki capital region in base year *b*. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in base year, base-year annual earnings, education (primary, secondary or tertiary), marriage dummy, base-year fixed effects, plant size, base industry, base province, base occupation. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table A11: The effect of displacement on log earnings, if employed, after five years for workers in Helsinki capital region

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.015**	-0.037***	-0.019**	-0.039***	-0.008	-0.033***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Displaced*Manual task usage		-0.002		-0.004		0.002
		(0.011)		(0.012)		(0.012)
Displaced*Routine task usage		-0.036***		-0.041***		-0.041***
		(0.012)		(0.013)		(0.013)
Displaced*Abstract task usage		-0.005		-0.005		-0.004
		(0.009)		(0.009)		(0.009)
Displaced*Social task usage		0.017**		0.021**		0.019**
		(0.008)		(0.009)		(0.009)
Displaced*Origin distance			-0.016*	0.010		0.010
			(0.008)	(0.011)		(0.011)
Displaced*Euclidean distance					-0.015**	-0.007
					(0.007)	(0.008)
Mean (not displaced)	10.653	10.653	10.653	10.653	10.653	10.653
Observations	323749	323749	323443	323443	322485	322485

Notes: See Table A10 for table notes. Sample includes those who were employed in $b+5$.

Table A12: The effect of displacement on employment after five years outside Helsinki capital region

	(1)	(2)	(3)	(4)
Displaced	-0.038***	-0.035***	-0.034***	-0.035***
	(0.003)	(0.003)	(0.003)	(0.003)
Displaced*Manual task usage		-0.011***		-0.014***
		(0.004)		(0.004)
Displaced*Routine task usage		-0.009*		-0.012**
		(0.005)		(0.005)
Displaced*Abstract task usage		0.001		0.001
		(0.004)		(0.004)
Displaced*Social task usage		0.019***		0.021***
		(0.003)		(0.003)
Displaced*Origin distance			-0.020***	0.009**
			(0.003)	(0.004)
Mean (not displaced)	0.912	0.912	0.912	0.912
Observations	747863	747863	746288	746288

Notes: Estimation results based on equation 3. The sample consists of workers who were 20–50 years old working outside of Helsinki region in base year *b*. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in the base year, base-year annual earnings, education (primary, secondary or tertiary), marriage dummy, base-year fixed effects, plant size, base industry, base province, base occupation. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table A13: The effect of displacement on log earnings, if employed, after five years for workers outside Helsinki capital region

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.042***	-0.042***	-0.037***	-0.043***	-0.023***	-0.029***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Displaced*Manual task usage		-0.005		-0.007		-0.006
		(0.008)		(0.008)		(0.008)
Displaced*Routine task usage		-0.037***		-0.041***		-0.036***
		(0.009)		(0.010)		(0.010)
Displaced*Abstract task usage		-0.012*		-0.012*		-0.013*
		(0.007)		(0.007)		(0.007)
Displaced*Social task usage		0.031***		0.035***		0.031***
		(0.006)		(0.006)		(0.006)
Displaced*Origin distance			-0.035***	0.010		0.014
			(0.005)	(0.008)		(0.009)
Displaced*Euclidean distance					-0.021***	-0.011**
					(0.005)	(0.005)
Mean (not displaced)	10.467	10.467	10.467	10.467	10.467	10.467
Observations	667810	667810	666330	666330	664562	664562

Notes: See Table A12 for table notes. Sample includes those who were employed in $b+5$.

Table A14: The effect of displacement on employment after five years for workers in small plants

	(1)	(2)	(3)	(4)
Displaced	-0.018***	-0.023***	-0.019***	-0.023***
	(0.003)	(0.003)	(0.003)	(0.003)
Displaced*Manual task usage		-0.012***		-0.012***
		(0.004)		(0.004)
Displaced*Routine task usage		-0.001		-0.000
		(0.005)		(0.005)
Displaced*Abstract task usage		-0.004		-0.004
		(0.004)		(0.004)
Displaced*Social task usage		0.013***		0.012***
		(0.003)		(0.003)
Displaced*Origin distance			-0.010***	-0.000
			(0.003)	(0.004)
Mean (not displaced)	0.920	0.920	0.920	0.920
Observations	502229	502229	501421	501421

Notes: Estimation results based on equation 3. The sample consists of workers who were 20–50 years old and working in plants with fewer than 50 workers in base year *b*. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in base year, base-year annual earnings, education (primary, secondary or tertiary), marriage dummy, base year fixed effects, plant size, base industry, base province, base occupation. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table A15: The effect of displacement on log earnings, if employed, after five years for workers in small plants

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.015**	-0.031***	-0.017***	-0.032***	-0.007	-0.026***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
Displaced*Manual task usage		-0.017**		-0.020**		-0.020**
		(0.009)		(0.009)		(0.009)
Displaced*Routine task usage		-0.024**		-0.029***		-0.027***
		(0.010)		(0.010)		(0.010)
Displaced*Abstract task usage		-0.016**		-0.015**		-0.016**
		(0.007)		(0.007)		(0.007)
Displaced*Social task usage		0.020***		0.023***		0.023***
		(0.007)		(0.007)		(0.007)
Displaced*Origin distance			-0.018***	0.010		0.011
			(0.006)	(0.009)		(0.009)
Displaced*Euclidean distance					-0.007	-0.001
					(0.006)	(0.006)
Mean (not displaced)	10.472	10.472	10.472	10.472	10.472	10.472
Observations	450335	450335	449579	449579	448333	448333

Notes: See Table A14 for table notes. Sample includes those who were employed in $b+5$.

Table A16: The effect of displacement on employment after five years for workers in large plants

	(1)	(2)	(3)	(4)
Displaced	-0.036***	-0.033***	-0.032***	-0.033***
	(0.003)	(0.003)	(0.003)	(0.003)
Displaced*Manual task usage		-0.019***		-0.020***
		(0.005)		(0.005)
Displaced*Routine task usage		-0.002		-0.002
		(0.006)		(0.006)
Displaced*Abstract task usage		0.006		0.006
		(0.004)		(0.004)
Displaced*Social task usage		0.018***		0.018***
		(0.004)		(0.004)
Displaced*Origin distance			-0.026***	0.001
			(0.003)	(0.005)
Mean (not displaced)	0.917	0.917	0.917	0.917
Observations	600526	600526	599445	599445

Notes: Estimation results based on equation 3. The sample consists of workers who were 20-50 years old and working in plants with more than 50 workers in base year *b*. A number of pre-displacement control variables are included but not reported: age, age squared, female dummy, tenure in base year, base-year annual earnings, education (primary, secondary or tertiary), marriage dummy, base-year fixed effects, plant size, base industry, base province, base occupation. Interaction covariates are only included in regressions in which they are interacted with the displacement dummy. * p<0.1; ** p<0.05; ***p <0.01

Table A17: The effect of displacement on log earnings, if employed, after five years for workers in large plants

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.042***	-0.039***	-0.037***	-0.040***	-0.023***	-0.026***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Displaced*Manual task usage		0.010		0.011		0.021**
		(0.010)		(0.011)		(0.011)
Displaced*Routine task usage		-0.056***		-0.060***		-0.056***
		(0.011)		(0.012)		(0.012)
Displaced*Abstract task usage		-0.011		-0.011		-0.009
		(0.008)		(0.008)		(0.008)
Displaced*Social task usage		0.030***		0.031***		0.022**
		(0.008)		(0.009)		(0.009)
Displaced*Origin distance			-0.047***	0.005		0.003
			(0.006)	(0.011)		(0.011)
Displaced*Euclidean distance					-0.028***	-0.013**
					(0.006)	(0.006)
Mean (not displaced)	10.574	10.574	10.574	10.574	10.574	10.574
Observations	541224	541224	540194	540194	538714	538714

Notes: See Table A16 for table notes. Sample includes those who were employed in $b+5$.

Table A18: The effect of displacement on employment after five years including interaction with base year wage residual

	(1)	(2)	(3)	(4)	(5)
Displaced	-0.028***	-0.030***	-0.028***	-0.033***	-0.030***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Displaced*Manual task usage		-0.014***			-0.016***
		(0.003)			(0.003)
Displaced*Routine task usage		-0.004			-0.004
		(0.004)			(0.004)
Displaced*Abstract task usage		0.002			0.002
		(0.003)			(0.003)
Displaced*Social task usage		0.016***			0.017***
		(0.002)			(0.003)
Displaced*Origin distance			-0.019***		0.002
			(0.002)		(0.003)
Displaced*Wage residual				0.009***	0.009***
				(0.002)	(0.002)
Mean (not displaced)	0.918	0.918	0.918	0.918	0.918
Observations	1102755	1102755	1100866	1102755	1100866

Notes: See Table A4 for table notes.

Table A19: The effect of displacement on log annual earnings, if employed, after five years including interaction with base year wage residual

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.031***	-0.039***	-0.031***	-0.040***	-0.018***	-0.028***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Displaced*Manual task usage		-0.006		-0.009		-0.005
		(0.007)		(0.007)		(0.007)
Displaced*Routine task usage		-0.038***		-0.039***		-0.037***
		(0.007)		(0.008)		(0.008)
Displaced*Abstract task usage		-0.004		-0.003		-0.003
		(0.005)		(0.005)		(0.005)
Displaced*Social task usage		0.024***		0.027***		0.023***
		(0.005)		(0.005)		(0.005)
Displaced*Origin distance				0.008		0.010
				(0.007)		(0.007)
Displaced*Wage residual			0.025***	0.023***		0.019***
			(0.005)	(0.005)		(0.005)
Displaced*Euclidean distance					-0.018***	-0.008**
					(0.004)	(0.004)
Mean (not displaced)	10.527	10.527	10.527	10.527	10.527	10.527
Observations	991559	991559	989773	989773	987047	987047

Notes: See Table A4 for table notes. Sample includes those who were employed in $b+5$.

Table A20: The effect of displacement on employment after ten years

	(1)	(2)	(3)	(4)
Displaced	-0.018***	-0.019***	-0.018***	-0.019***
	(0.003)	(0.003)	(0.003)	(0.003)
Displaced*Manual task usage		-0.005		-0.008*
		(0.004)		(0.004)
Displaced*Routine task usage		-0.001		-0.003
		(0.004)		(0.005)
Displaced*Abstract task usage		0.003		0.003
		(0.003)		(0.003)
Displaced*Social task usage		0.010***		0.013***
		(0.003)		(0.003)
Displaced*Origin distance			-0.006**	0.009**
			(0.003)	(0.004)
Mean (not displaced)	0.865	0.865	0.865	0.865
Observations	1091626	1091626	1089759	1089759

Notes: See Table 4 for table notes.

Table A21: The effect of displacement on log earnings, if employed, after ten years

	(1)	(2)	(3)	(4)	(5)	(6)
Displaced	-0.033***	-0.040***	-0.034***	-0.041***	-0.022***	-0.031***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Displaced*Manual task usage		-0.011		-0.014*		-0.010
		(0.007)		(0.008)		(0.008)
Displaced*Routine task usage		-0.032***		-0.035***		-0.035***
		(0.008)		(0.009)		(0.009)
Displaced*Abstract task usage		-0.005		-0.004		-0.005
		(0.006)		(0.006)		(0.006)
Displaced*Social task usage		0.009*		0.013**		0.009
		(0.005)		(0.006)		(0.006)
Displaced*Origin distance			-0.027***	0.011		0.010
			(0.005)	(0.008)		(0.008)
Displaced*Euclidean distance					-0.003	0.006
					(0.005)	(0.005)
Mean (not displaced)	10.554	10.554	10.554	10.554	10.554	10.554
Observations	905203	905203	903587	903587	899867	899867

Notes: See Table 4 for table notes. Sample includes those who were employed in $b+10$.

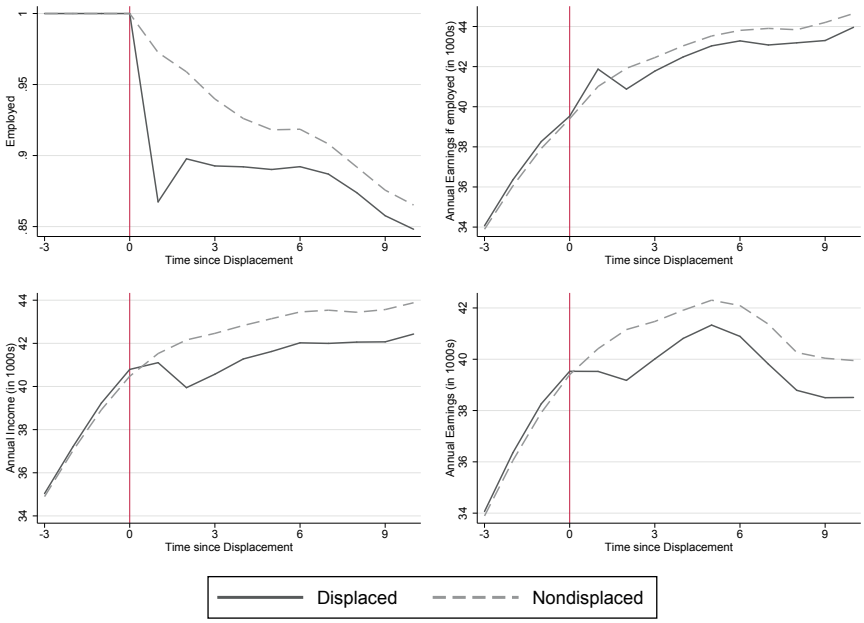

Figure A1: Labor market outcomes by displacement status. Solid lines describe the outcomes for displaced workers. Dashed lines are the outcomes of non-displaced workers.

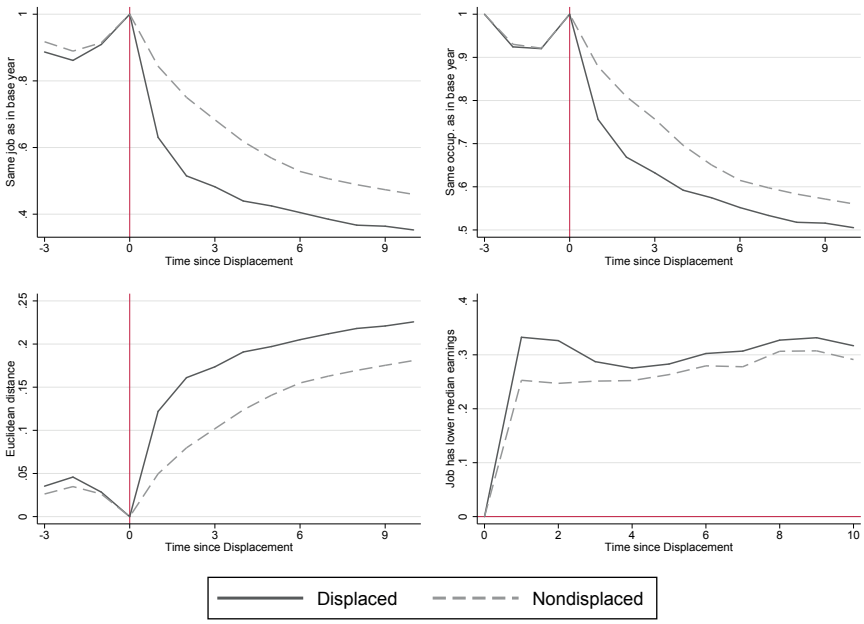

Figure A2: Job, occupation, and distance by displacement status. Solid lines describe the outcomes for displaced workers. Dashed lines are the outcomes of non-displaced workers.

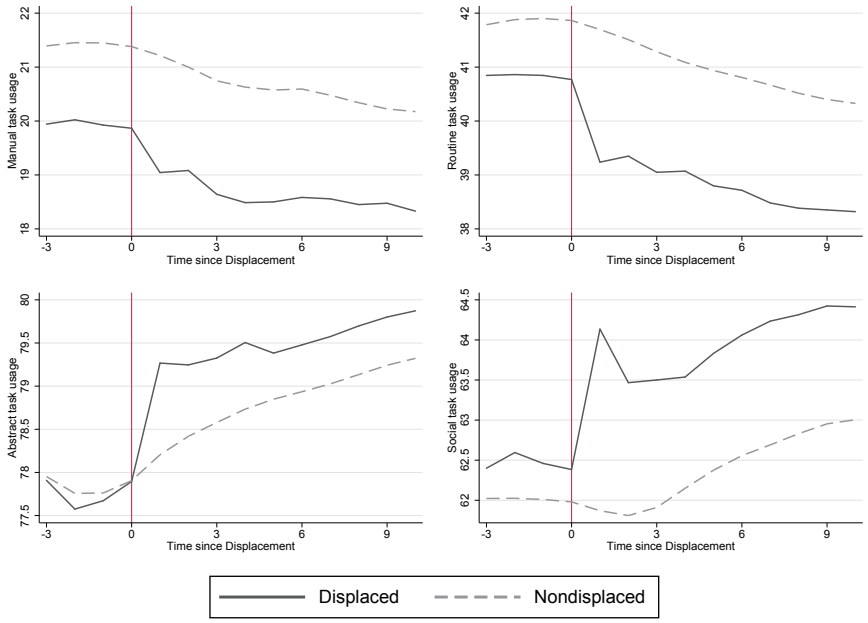

Figure A3: Task usage by displacement status. Solid lines describe the outcomes for displaced workers. Dashed lines are the outcomes of non-displaced workers.

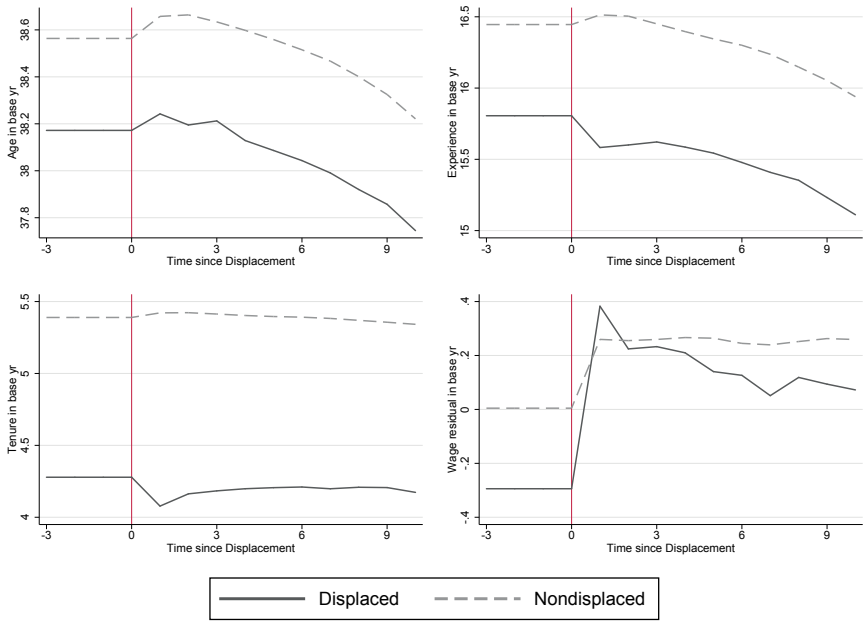

Figure A4: Base year characteristics of employed workers. Solid lines describe the outcomes for displaced workers. Dashed lines are the outcomes of non-displaced workers.

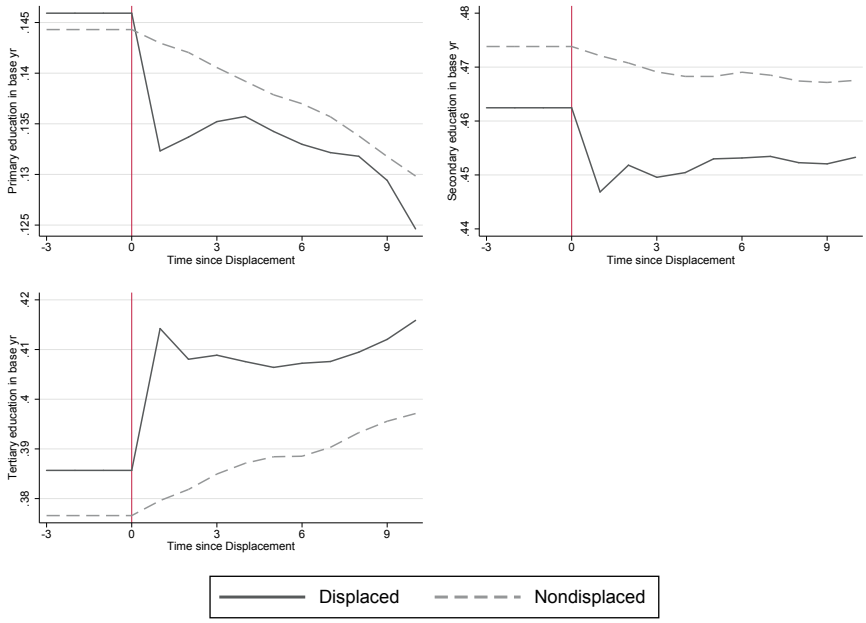

Figure A5: Base year characteristics of employed workers. Solid lines describe the outcomes for displaced workers. Dashed lines are the outcomes of non-displaced workers.

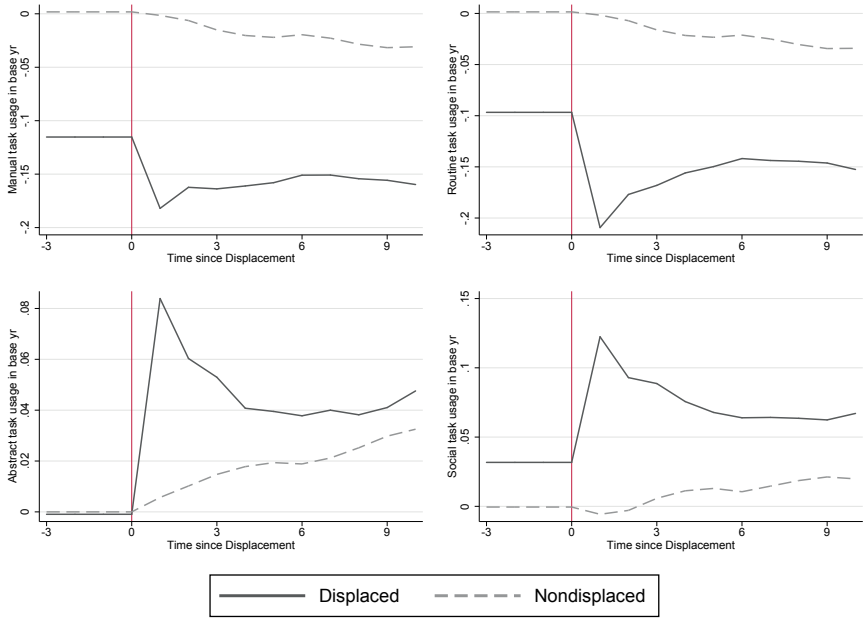

Figure A6: Base year task usage of employed workers. Solid lines describe the outcomes for displaced workers. Dashed lines are the outcomes of non-displaced workers.

C Variable definitions

- *Employed*: A worker is defined to be employed if her main activity, i.e. employment relationship during the last week of the year, is employed (ptoim1=11) and she does not have a missing encrypted establishment code (sykstun).
- *Annual earnings*: Annual earnings include earned income, i.e. wage income (tyotu). Deflated to year 2013 euros. If annual earnings are missing they are coded to be zero.
- *Annual income*: Annual income includes total earned income (svatva). If annual income is missing it is coded to be zero. Deflated to year 2013 euros.
- *Annual earnings, if employed*: Annual earnings are coded to be missing if the person does not have an occupational code or an industry code, which by definition means that the person is not employed. Deflated to year 2013 euros.
- *Same job as in base year*: A worker is defined to have the same job as in base year if (s)he has the same occupation (1-digit) in the same industry (1-digit) in a given time $b+t$ as in base year b. If the worker is not employed, the variable is coded to missing.
- *Same occupation as in base year*: A worker is defined to have the same occupation as in base year if (s)he has the same occupation (1-digit) in a given time $b+t$ as in base year b. If the worker is not employed, the variable is coded to missing.
- *Euclidean distance*: Euclidean distance is the distance in task usage between the job the worker holds at time $b+t$ compared to the job in base year b calculated by equation 1. If the worker is not employed, the variable is coded to missing.
- *Change in task usage*: Change in task usage (i.e. abstract, routine, manual and social) is the change in the worker's level of task usage in the job that the worker holds in time $b+t$ relative to the level of task usage in the base job. If the worker is not employed, the variable is coded to missing.

Elinkeinoelämän tutkimuslaitos

The Research Institute of the Finnish Economy

ISSN-L 2323-2420
ISSN 2323-2420 (print)
ISSN 2323-2439 (pdf)

Tel. +358-9-609 900
www.etla.fi
firstname.lastname@etla.fi

Arkadiankatu 23 B
FIN-00100 Helsinki